



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/809,832	03/26/2004	Seishi Kasai	Q80751	7954

23373 7590 08/14/2006  
SUGHRUE MION, PLLC  
2100 PENNSYLVANIA AVENUE, N.W.  
SUITE 800  
WASHINGTON, DC 20037

EXAMINER
----------

LAMBELET, LAWRENCE EMILE

ART UNIT	PAPER NUMBER
----------	--------------

1732

DATE MAILED: 08/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

✓

**Office Action Summary**

Application No.

10/809,832

Applicant(s)

KASAI ET AL.

Examiner

Lawrence Lambelet

Art Unit

1732

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on 26 May 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
 Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
 Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Amendment***

Applicant's Amendment under 37 CFR §1.111, filed 5/26/2006, is considered in this Office Action. The previous Non-Final Office Action, filed 2/27/2006, rejected claims 1-10 and 12-20 under 35 USC §102(b) and claim 11 under 35 USC §103(a).

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 recites the limitation "the UV curable binder". There is insufficient antecedent basis for this limitation in the claim. Examiner suggests that this claim depend from independent claim 2.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10, and 12-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brodkin et al (U.S. Patent 6,322,728), and further in view of Halloran et al (U.S. Patent 6,117,612).

Brodkin et al, hereafter "Brodkin", discloses a process of producing a three-dimensionally shaped article, as required by claims 1, 2, and 3. Brodkin teaches spreading a thin layer (prescribed thickness) of a powder material on a bed and printing binder into selected areas (cross-sectional shape) of the powder layer. This is shown at lines 63-67 in column 3, lines 1-12 in column 4, lines 29-34 in column 4, and in the Abstract. The selected areas correspond to an intersection of a desired plane (cut surface) with a CAD representation of the article, as shown at lines 1-10 and lines 29-34 in column 4. Brodkin further teaches repeating these steps successively to build the article at lines 38-39 in column 4. The refractive index of the powder,  $n_1$ , and the refractive index of the binder,  $n_2$ , are inherent properties of those materials.

Brodkin also teaches that the powder is a silica material, as required by claim 5, at lines 41-43 in column 5. Examiner notes that silica gel is a colloidal form of silica. Brodkin further teaches that the particle size of the powder is from 0.1-5.0  $\mu\text{m}$ , which matches the range of claims 7, 16, and 17, as can be found at lines 53-55 in column 7. Brodkin still further teaches, at lines 47-57 in column 5, that a plastic powder can be used with a plastic binder, as required by claim 4. It would have been obvious to one skilled in the art, pursuing a match of refractive indices, to use powder and liquid forms of the same material to bind the powder.

Brodkin also teaches the addition of colorants, as required by claim 12, and dyes, as required by claim 13, at lines 58-62 in column 5. Brodkin further teaches an inkjet mode of feeding binder, as required by claim 15, at lines 29-34 in column 4.

Brodkin does not teach that  $n_1$  and  $n_2$  satisfy the relationship  $-0.1 \leq (n_1 - n_2) \leq 0.1$ , as required by claims 1 and 2.

Halloran et al, hereafter "Halloran", teaches a  $\Delta n$  reduced to zero, or "index matched". Reference is made to lines 60-68 in column 3 and lines 37-42 in column 4. The system of Halloran is composed of a powder and a curable resin which is consistent with the recitation of the claims. Although the curable resin is not added to the powder as a binder in the curing step, the end result is the same after curing takes place. Therefore, the relationship above is satisfied in the article which is produced by the curing step.

Brodkin and Halloran are combinable because they are concerned with a similar technical field, that of rapid prototyping. It would have been obvious to one of ordinary skill in the art at the time of the invention to include in the process of Brodkin the technique of matching refractive indices of the constituents, as taught by Halloran, and would have been motivated to do so to for better penetration of light leading to rigorous cure.

Brodkin does not expressly teach a UV curable binder and the step of irradiating to effect cure, as required by claims 2 and 3, although Brodkin does mention UV absorbers in the mixture at lines 53-54 in column 6. Brodkin further does not teach that the UV binder contains a polyfunctional acrylate or

methacrylate monomer, as required by claim 8. Brodtkin still further does not teach the monomer in a range of 20-90% by weight, as required by claim 9.

Continuing, Brodtkin does not teach a viscosity range of 1-30 mPa·s for the UV binder, as required by claim 14. Brodtkin further does not teach a solvent free UV binder, as required by claims 18, 19, and 20, or a volatile component of not more than 5% by weight, as required by claims 3 and 6.

Halloran does teach a UV curable liquid phase which is irradiated by a UV laser to produce the bound article. This teaching can be found at lines 18-24 in column 5 and lines 33-37 in column 6. The liquid phase of the Halloran system is comparable to the binder of the claim recitation in that it is the medium of polymerization pursuant to irradiation. The application of the medium to the powder differs, but the result of the combination is the same. The shift in application from precursor mixture to deposition would have been obvious as a matter of choice to one of ordinary skill in the art.

Halloran further teaches that the UV curable material is an acrylate monomer at lines 44-49 in column 5, and still further teaches a weight percent of the monomer overlapping the claimed range at lines 5-10 in column 6. Halloran also teaches a viscosity of the liquid phase below 10 mPa·s at lines 65-67 in column 5 and a "neat" (solvent-free) liquid phase at lines 14-16 in column 6.

Halloran is silent as regards an amount of volatile component, but places value on freedom from volatile emissions at lines 1-5 in column 6. This is taken to mean that any volatile component is negligible and therefore falls below the claim limitation of 5%.

It would have been obvious to one of ordinary skill in the art at the time of the invention to include in the process of Brodtkin the UV curable liquid phase, and properties thereof, as taught by Halloran, and would have been motivated to do so to assure penetration of the cure into sub layers, thereby providing integrity of the build.

Brodtkin does not expressly teach a UV curable binder which contains not more than 70% weight of a viscosity modifying additive, as required by claim 10, although a filler of 65-85% weight is disclosed at line 33 in column 7. Examiner notes that such an additive would modify the viscosity of the liquid phase component.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brodtkin in view of Halloran, as applied to claims 1-10 and 12-20 above, and further in view of Maitland (UV Printing/UV Chemistries).

Brodtkin modified by Halloran discloses the process of claims 1-10 and 12-20, as discussed above. Brodtkin also teaches incorporating a photopolymerization initiator, as required by claim 11, at lines 53-67 in column 6. The reference mentions UV, and therefore, the range of 450 to 250 nm is implicit.

Brodtkin modified by Halloran does not disclose an initiator of range 0.05% to 10% by weight, as required by claim 11.

Maitland teaches an initiator concentration of 2% to 5% in page 3, "UV Formulation".

Brodtkin, Halloran, and Maitland are combinable because they are concerned with a similar technical field, that of UV curing. It would have been

obvious to one of ordinary skill in the art at the time of the invention to include in the process of Brodtkin and Halloran the polymerization initiator range of Maitland, and would have been motivated to do so to prevent yellowing the product.

### ***Response to Arguments***

Applicant's arguments, see pages 1-5, filed 5/26/2006, with respect to the rejection(s) of claim(s) 1--10, and 12-20 under 35 USC § 102(b), and claim 11 under 35 USC § 103(a), have been fully considered and are persuasive. Therefore, the rejections have been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art. Applicant argues that the reference, Brodtkin et al, does not fairly teach that the refractive index of the powder material,  $n_1$ , and the refractive index of the binder material,  $n_2$ , satisfy the relationship recited in claim 1,  $-0.1 \leq (n_1 - n_2) \leq 0.1$ . Applicant further argues that Brodtkin et al does not teach a UV binder or an irradiation step. The new disclosure of Brodtkin et al, modified by Halloran et al (see discussion), makes a prima facie case for obviousness.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence Lambelet whose telephone number is 571-272-1713. The examiner can normally be reached on 8 am-4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on 571-272-1176. The



fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LEL

  
**CHRISTINA JOHNSON**  
**PRIMARY EXAMINER**

8/3/06